

Effects of different levels of urea on the growth and yield of tomato

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ABSTRACT: In order to evaluate the effects on growth and yield of tomato plants in a soil sample, tested in a completely randomized design with three replications. Urea levels at zero, 50, 100, 150 and 200 mg per kg of soil was used. Factors examined included: Number of flowers and fruit yield, vitamin C, total acidity, TSS, plant height, average fruit size, number of days to flowering, plant dry weight and chlorophyll index. The results showed that the highest number of flower Treated with 100 mg of urea nitrogen per kilogram of soil, and minimum control level, Most of the fruits and the lowest levels seen in urea 100 and 150; Maximum yield 150 and the lowest level of the urea-treated controls were observed. For most traits, the use of nitrogen fertilizer, urea, 100 and 150 are the best. The results of this study concluded that urea nitrogen and growth factors are more effective reproductive factors on the growth of tomato plants will have the desired effect.

Keywords: Tomato, urea, Yield

INTRODUCTION

Tomato (*Lycopersicon esculentum*) is one of the most important fruity vegetables, which due to high nutrient value, is in the second rank in regards level under cultivation and consumption (Daneshvar, 2000). Nitrogen (N) is one of the most essential nutrients needed Plants and other organisms, such as water, The plant needs to factor in plant growth is more than other factors. However, Even though N has been appropriated about 79% voluminal of atmosphere but many plants involved to nitrogen shortage due to deficit of organic matter in these soils, specially the plants that grow in dry and semi-dry regions (Rajaei, 2010). Urea or Carbamide is an organic composition with chemical formula $\text{CO}(\text{NH}_2)_2$. More than 90% of urea in the world is produced in order to application as nitrogen chemical fertilizers. Urea with 46% nitrogen, has the greatest nitrogen amount among all nitrogen solid fertilizers and on this basis, urea has the lowest transportation cost in lieu of each nitrogen unit. Urea is presented as small pearl grains, which is called "Sugar fertilizer" (Salardini, 1987). (Flores et al., 2001) in evaluation the effect of different levels of ammonia on reduction of salinity effect on tomato plant development, nutrition, and metabolites concluded that badness influence of salinity stress can be decreased by using ammonium in medium because ammonium nutrition is relative to nitrogen absorption and apply as well as iron and chlorophyll concentration in the leaves. (Ahmed et al., 2008) showed that application of urea and triple super phosphate and mixed Zeolite might have many advantages more than urea without additional materials. Different types of plants are grown in the world today. Its roots are deep, sometimes over a meter, which is the planting, production of lateral roots will be strong. Creeping stems and branches to the 5/1 meters, but some varieties have short stems that stand up, stand strong in the air without support stands guardian. This plant's leaves are alternate and compound the size of the different varieties is not uniform. The leaves are bright green in color and the back is usually fluff. Five yellow petals are joined together in the end are separated. Green calyx has five sepals long and drawn or spear-shaped petals are smaller than the first but it is enhanced during fruit growth. Five stamens with large anthers that is placed on a short rod. Tomato fruits, berries and a cavity is formed between the two. Color and shape of the fruit, being late or early fruit, meat or fruit juiciness and finally smooth or wrinkled fruit of different tomato varieties will vary. The fruit of the tomato plant a few factors that have reciprocal effects on each other (Msharmvhd, 1371). (Keeny and Nilson, 1982) in evaluation the effect of organic and chemical fertilizers on quantitative and qualitative yield of tomato c.v 'Chief' found that the

greatest fruit yield obtained in application of 15 ton/ha hen manure and 90 kg/ha pure nitrogen and the highest fruit number in application of 20 ton/ha hen manure and 135 kg/ha pure nitrogen. (Akhtari et al., 1391) Effect of Nitrogen Fertilizer on the quantity and quality of radish plants and found. With increasing levels of nitrogen significantly increased tuber yield so that up to 250 kg N ha tuber yield increased by 375 kg ha yield loss, but the treatment was observed. (Babai et al., 1389) using nitrogen fertilizers in management of Egyptian broomrape on tomatoes Fertilizers, urea, ammonium nitrate and ammonium phosphate and 300 kg ha each in quantities of 150 and ammonium sulfate at doses of 250 and 500 kg ha been used as a treatment Ammonium sulfate, ammonium phosphate treatments and found that 250 and 150 kg ha had the best performance tomato and Orobanche control were not significantly different. Maximum shoot and root dry weight of ammonium phosphate and urea at 150 and 250 kg ha ammonium sulphate and ammonium nitrate lowest root dry weight was 150 and 300 kg per hectare. Ammonium sulfate 250 kg ha significant impact on reducing Orobanche attachment and growth as well as improved yield and tomato compared to the control of broomrape. . (Musavi Shalmani et al., 2002) in using 15-N isotopic method to evaluate efficiency of different levels of urea under fertilizer-drip irrigation system and its comparison with furrow irrigation in tomato plant reported that despite increasing fertilizer amount in fertilizer-irrigation system, plant portion in absorption of nitrogen element almost remain constant is consequently increasing nitrogen losing. They recommended 100 mgL⁻¹ N (urea form) as suitable treatment because of 54% N absorption by plant. Also narrow irrigation system with 83% nitrogen losing had the lowest efficiency.

MATERIALS AND METHODS

This experiment arranged in a city in Fars province was conducted in September 1391. In this study, the effect of urea nitrogen fertilizer on growth and flowering time Klijy tomato varieties were studied in a calcareous soil. Originally chosen within 60 pots each 5 kg of soil in each pot and poured two tomato seeds were planted. The treatments included the levels of zero, 50, 100, 150 and 200 mg per kg of soil nitrogen from urea were each separately added to each pot. In addition to providing 80 mg of potassium, phosphorus, potassium and phosphate and triple super phosphate and potassium sulphate per kg of soil were added to the pot equally. After four leaf emergence and the strongest seedling in each pot was removed and the other left. This research in a completely randomized design with 15 treatments and 3 replications. Treatments consisted of 50, 100, 150 and 200 mg N per kg soil of a N (14 treatments) and a control treatment. Statistical analysis using software MSTATC and comparison using Duncan's new multiple range test was performed at (DMRT) ($P < 0.01$).

RESULTS AND DISCUSSION

Results

flower number

As can be seen from Table 1-1 and scored the highest number of 100 mg of urea nitrogen (8/18 goals) and lowest in the control treatment (0/5 flower) were found. Urea increases from zero to 100 led to a significant increase in the number of goals scored, but was significantly decreased from 100 to 200.

Fruit number

As is clear from Table 1-1 Maximum number of fruits in the 150 and 200 mg N in this treatment (the 3/6 and 0/7 fruits) were And lowest in the control treatment (0/2 fruit) was found. Urea levels increased from zero to 100, but the number of fruits, fruit number decreased from 150 to 200. In this regard, the 50 and 200 levels were not significantly different.

Plant yield

The results in Table 1.1 that comes with the highest yield of 150 mg of N in this treatment (5/344 mg) was And lowest in the control and 200 levels of urea (respectively 2/114 and 8/122 g) was found. Urea increases from zero to 150 led to a significant increase in yield, but yield decreased from 150 to 200.

Chlorophyll Index

As is clear from Table 1-1, the maximum chlorophyll index level of 150 mg N in this treatment (1/53) and Lowest chlorophyll levels (control) (5/33), respectively. This increase was significant from 50 to 100. From 150 to 200, chlorophyll index was significantly decreased. The relationship between the levels of 50, 100 and 200 were not significant.

Percent increase in plant height in the first stage after fertilization

Results Table 1.1 shows that the largest percentage increase in plant height in the first stage after fertilization at 50 mg N In this treatment (4/369%) and the lowest level of 200 mg urea nitrogen treatments (0/81%) was obtained. Urea level increased from zero to 50 percent, resulting in a significant increase in plant height was increased from 50 to 200, but was significantly decreased.

Percent increase in plant height in the second stage after fertilization

As can be seen from Table 1-1, the second highest percentage increase in plant height After fertilization at 50 and 200 mg N in these treatments (respectively 6/548 and 8/554 percent) And the lowest levels (8/337%) were obtained Urea level increased from zero to 50 percent, resulting in a significant increase in plant height was increased from 50 to 150, but was significantly decreased. This process significantly increases the level of 150 to 200.

Days to flowering

As Table 1-1 shows the maximum number of days to flowering levels (3/48 days) And the lowest 50 levels of urea (0/25 days), respectively. The use of urea in the early crop. Urea increases from zero to 150 reduces the number of days to flowering, days to flowering, but a significant increase from 150 to 200.

Plant fresh weight

Table 1-1 can be inferred from the results that the maximum weight of 150 mg N plant this treatment (16/165 mg) was She weighed less than 50 plants and urea levels (respectively 75/60 and 41/65 mg) was obtained. Urea increases from zero to 150 led to a significant increase in plant fresh weight. This increase was not statistically significant from zero to 50.

Plant dry weight

As can be seen from Table 1-1, the highest plant dry weight at 100 and 150 (respectively 01/48 and 17/56 mg) and The lowest levels (10/20 g) was observed. This increase was not statistically significant from zero to 50 and from 50 to 100.

Table 1.1 . Comparison of different levels of urea on the traits

Urea levels Attribute	Witness	Urea 50	Urea 100	Urea 150	Urea 200
Flower number	5/0d	15/6b	18/8a	12/7bc	10/0c
Fruit number	2/0b	3/0b	6/3a	7/0a	2/3b
Plant yield	114/2d	176/4c	311/7b	344/5a	122/8d
ChlorophyllIndex	33/5c	38/7b	42/6b	53/1a	43/9b
Drsdafzaysh height 1	146/1c	369/4a	189/5b	145/3c	81/0d
Drsdafzaysh height 2	337/8d	548/6a	452/4b	407/1c	554/8a
Days to flowering	48/3a	25/0c	25/7c	26/3c	39/3c
Plant fresh weight	60/75d	65/41d	144/86b	165/16a	99/54c
Plant dry weight	20/10b	23/11b	48/01a	56/17a	30/80b

†Means in each column having the same letter, have not significant difference ($P \leq 0.01$) according to DMRT

Discussion

Use of fertilizers and urea nitrogen in tomato plants, a significant positive results in studies of many domestic and foreign scholars and researchers has shown This research is not exempt from this law The results and conclusions of the study explains.

flower number

As already mentioned in the discussion of different levels of urea a significant effect on the number of flowers So have the number of flowers increased with increasing urea But at higher levels of 100 mg N in plant shoots and burns have been dropped. It indicates that the increasing use of nitrogen fertilizer urea plant reproductive growth is reduced he problem with the results obtained by (Mousavi et al .,1381) is consistent.

fruit number

With increasing levels of urea nitrogen in fruit number increased but this increase was not significant. The use of nitrogen fertilizer urea, urea and the lowest number of fruit were observed. With the increasing use of nitrogen

fertilizer urea plant reproductive growth is reduced Leading to a reduction in the number of fruit. The results obtained by the (spiritual man and colleagues ,1389) is consistent.

Plant Yield

The highest yield and the lowest were observed in the use of urea. Increased levels of urea nitrogen fertilizer increased from 50 to 150 will yield, but yield was reduced from 150 to 200. Since the yield factor increased urea nitrogen levels decreased from 100 to above Yield provided. It can be concluded that the excessive use of nitrogen fertilizer urea plant could adversely affect the reproductive growth takes place Has a negative effect on yield and with results obtained by (Delshad et al .,1379 and Babai et al .,1389) is consistent.

Chlorophyll Index

The use of nitrogen fertilizer urea, urea maximum chlorophyll index in the 150 and the lowest was observed. Elevated chlorophyll index was increased from 50 to 150, and this is indicative of the problem Urea nitrogen fertilizer on tomato plant growth and GREENS are effective in increasing levels of urea nitrogen and chlorophyll content of the plants increased. The results obtained by the (attachment and colleagues ,1386) is consistent.

Percent increase in plant height in the first stage after fertilization

Based on the results described in the previous topic, urea 150 was not significantly different from controls. The greatest percentage increase in the height of the lowest on the use of urea and urea was 200 and it can thus be concluded The increase in urea fertilizer on tomato plant growth and the positive effects will be more effective and urea on plant height index The problem with the results obtained by the (attachment and colleagues ,1386) is consistent.

Percent increase in plant height in the second stage after fertilization

In this regard, all treatments were significantly different from control. The greatest percentage increase in the use of urea and the lowest plant height was observed. The use of urea from 50 to 150 percent reduction in plant height was increased from 150 to 200 and given that most of the nitrogen fertilizer treatments increased plant height, there is This indicates that the urea nitrogen fertilizer on the growth of tomato plants are The results obtained by the (attachment and colleagues ,1386) is consistent.

Days to flowering

In this regard, all treatments were significantly different from controls. Use of nitrogen fertilizer urea can significantly accelerate flowering. Maximum number of days to flowering of the control and lowest Due to the increase in urea levels increased with increasing number of days to flowering and nitrogen, the product was further delayed, It can be stated that the use of high levels of urea, will delay the reproductive growth of tomato and vegetative growth will provide Nissan with the (results and associates ,1382) is consistent.

Plant fresh weight

As mentioned in the previous topic, treatment, urea 50 was significantly different from controls. Maximum weight of urea per 150 and the lowest was observed. Increased levels of nitrogen increased from 50 to 150, but the 150 to 200 weight per plant fresh weight decreased These also show that the use of nitrogen fertilizer, urea up to 150, Mg per kg of soil, the growth of tomato plants are and increase the fresh weight of tomato plants that provide it with the results of (Babai et al .,1389) is consistent.

Plant dry weight

The plant dry weight, urea 100 and 150 were significantly different from controls. The maximum dry weight of urea in 150 and the lowest was observed. Increased from 50 to 150 increase in urea plant dry weight was But the plant dry weight decreased from 150 to 200 and from the results it can be concluded Nitrogen fertilizer urea up to 150 mg per kg of dry weight of tomato plants are Provide vegetative growth of tomato plants. The results obtained by (Babai et al .,1389) is consistent.

REFERENCES

Abdul-Baki AA, Teasdale JR, Korcak R, Chitwood DJ and Huettel RN. 1996. Fresh-market tomato production in a lowinput alternative system using cover-crop mulch. Hort. Sci. 31.

- Babaei S, Alizadeh H, Jahansouz MR, Rahimian-Mashhadi H, Minbashi-Moeini M. 2010. Management of Egyptian Orobanche by using nitrogen fertilizers in tomato. *Journal of Weed Science* 4(2):79-89. (In Persian).
- Daneshvar MH. 2000. *Vegetables growing*. Shahid-Chamran University Press. (In Persian).
- Delshad M, Babalar M, Kashi AK. 2000. Effect of nitrogen index of nutrient solution in mineral nutrient of three greenhouse tomato cultivars in hydroponic culture. *Journal of Iranian Agricultural Sciences* 31(3):613-625. (In Persian).
- Ejraei AK. 2009. *Soil fertility*. Text booklet of Islamic Azad University of Jahrom, Khayam Press. (In Persian).
- Flores P, Carvajal M, Cerda A, Martinez V. 2001. Salinity and ammonium/nitrate interactions on tomato plant development, nutrition, and metabolites. *J of Plant Nutrition* 24(10):1561-1573.
- Haravi R, Babalar B, Kashaki AA, Mirabdolbaghi M, Askari M. 2005. Effect of some nutrient solution and medium in hydroponic system on quantitative and qualitative traits of greenhouse tomato c.v Hamra. *Journal of Iranian Agricultural Sciences* 939-946. (In Persian).
- Keeney DR, Nelson DW. 1982. Methods of soil analysis part2. In A.L. Page, D.R. Keeney, D.E. Baker, R.H. Miller, R. Elis. and J.D. Rhades. *Nitrogen-inorganic forms*. Agron. Monogr., 9: ASA and SSSA, Madison, WI, USA.
- Musavi-Shalmani MA, Sagheb N, Hobbi MS, Teimouri S, Khorasani A, Pirvali-Biranvand N. 2002. Using 15-N isotopic method to evaluate efficiency of different levels of urea under fertilizer-drip irrigation system and its comparison with furrow irrigation in tomato plant. *Journal of nuclear Sciences and Techniques* 26:44-48. (In Persian) .
- Maanavifard M, Dashti F, Ershadi A, Jalali M. 2010. Effect of resources (urea and ammonium nitrate) and different levels on nitrogen fertilizers on quantitative and qualitative traits and nitrate accumulation in Iranian Leek. *Journal of Iranian Agricultural Sciences* 301-308. (In Persian).
- Neisani S, Fallah S, Reisi A. 2003. Influence of hen manure and urea on quantitative and qualitative traits of tomato. *Permanent Agricultural Science* 63-74. (In Persian).
- Peivast G. 2007. Effect of vermi-compost and nitrogen fertilizer on growth, yield and qualitative traits and nitrate accumulation in Spinach. 5th Iranian Horticultural Sciences Congress Shiraz University. (In Persian).
- Salardini AA. 1987. *Soil fertility*. Tehran University Press, p. 44. (In Persian).